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AVERAGE AND PROBABILITY.

71. Proposed by B. F. FINKEL, A. M., M. Sc., Professor of Mathematics and Physics, Drury College, Springfield, Mo.

Find the average volume removed by boring an inch auger-hole through a cube whose edge is e , the auger to pass through two opposite faces of the cube.

72. Proposed by B. F. FINKEL, A. M., M. Sc., Professor of Mathematics and Physics, Drury College, Springfield, Mo.

A rod is broken at random into four pieces; find the chance that no one of the pieces is greater than the sum of the other three. [From *C. Smith's Treatise on Algebra*, page 528.]

*** Solutions of these problems should be sent to B. F. Finkel not later than December 10.

MISCELLANEOUS.

68. Proposed by WILLIAM HOOVER, A. M., Ph. D., Professor of Mathematics and Astronomy in Ohio State University, Athens, Ohio.

Find the locus of the vertex of the cone enveloping the ellipsoid $x^2/a^2 + y^2/b^2 + z^2/c^2 = 1$ so that the plane of contact will constantly touch $x^2 + y^2 + z^2 = r^2$.

69. Proposed by WILLIAM SYMMONDS, A. M., Professor of Mathematics and Astronomy, Pacific College, Santa Rosa, P. O., Sebastopol, Cal.

Find the locus of a point equi-distant from the circumferences of two fixed circles.

*** Solutions of these problems should be sent to J. M. Colaw not later than December 10.

BOOKS.

Advanced Mechanics. Vol. I. *Dynamics.* The Organized Science Series. By William Briggs, M. A., F. E. S., F. R. A. S., and G. H. Bryan, Sc. D., F. R. S. 327 pages. Price, \$1.00. 1898. London: W. B. Clive. New York: Hinds & Noble.

The notion of relative velocities is introduced at an early stage in the discussion of the laws of composition and resolution. The chapters on motion down inclined planes, chords of quickest descent, the parabolic path of a projectile, circular and harmonic motion, small oscillations of a pendulum, impact of elastic spheres, and the elements of rigid dynamics are highly satisfactory. There are numerous exercises. The plan of the book is good, and in the execution there is much to commend.

We have also received *Elementary Mechanics*, by the same authors, in the University Tutorial Series, which gives special prominence to fundamental principles, and is an especially good book of its grade.

J. M. C.

Coördinate Geometry. The Right Line and Circle. By Briggs and Bryan. University Tutorial Series. Third Edition. 220 pages. Price, 80 cents.

In this elementary treatise the editors have tried "to realize the position of the average learner, and have constantly borne in mind the needs of the private student." The result is altogether satisfactory.

J. M. C.

Mensuration and Spherical Geometry. By William Briggs, M. A., F. C. S., F. R. A. S., and T. W. Edmondson, B. A. Second Edition. \$1.00. London: W. B. Clive. New York: Hinds & Noble.

The subject is not presented in the form of a mere collection of rules and examples, but in every case a proof of the formula to be used has been given. There are no material alterations in the revision, but some errors have been eliminated and some inaccuracies corrected. The work as now presented is well arranged and fairly comprehensive in treatment. It will be found a serviceable text.

J. M. C.

Differential and Integral Calculus. By James M. Taylor, A. M., LL. D., Professor of Mathematics, Colgate University. Revised Edition. 1898. 8vo., cloth. xiii + 269 pages. Price, \$2.15. Boston: Ginn & Company.

In this revision of Professor Taylor's popular text the attempt has been made to present in their unity the three common methods in the Calculus. In his preface, the author says that "the concept of Rates is essential to a statement of the problems of the Calculus; the principles of Limits make possible general solutions of these problems, and the laws of Infinitesimals greatly abridge these solutions." The Method of Rates is so generalized and simplified that it does not involve "the foreign element of time," and affords simple and brief proofs of first principles. By proving $lt(\Delta y/\Delta x) = dy/dx$, the problem of rates is reduced to one of limits or infinitesimals. The Theory of Infinitesimals is viewed simply as that part of the theory of limits which deals with *variables having zero as their common limit*. Emphasis is also laid upon the distinction between infinitesimals and zero and that between infinites and $a/0$. A chapter on differential equations is an important addition to the text. The table of integrals is useful. Throughout the work are found numerous practical problems from mechanics and other branches of applied mathematics. One of the most distinctive features of this text (though it may be a source of objection to some) is the facility with which it may be used by teachers who may prefer either one of the three methods commonly used in the Calculus, as those who wish to pursue the study by the method of Limits or Infinitesimals alone can omit the few demonstrations which involve rates and take in their stead those by limits or infinitesimals. We bespeak for the book a hearty welcome from teachers.

J. M. C.

Differential and Integral Calculus, for Technical Schools and Colleges. By P. A. Lambert, M. A., Assistant Professor of Mathematics, Lehigh University. 8vo. Cloth. x + 246 pages. Price, \$1.50. New York: The Macmillan Co.

This work is designed for students who have a working knowledge of Elementary Geometry, Algebra, Trigonometry and Analytical Geometry. The author states that the object of the book is: (1) By a logical presentation of principles to inspire confidence in the methods of the infinitesimal analysis; (2) By numerous problems to aid in acquiring facility in applying these methods; (3) By applications in Physics and Engineering, and other branches of Mathematics, to show the practical value of the Calculus.

Proposing problems belonging to Engineering is a good idea, and it would be well in making up lists of exercises to go in future works on the Calculus, to insert more problems in Economics and Engineering.

B. F. F.

Text-Book of Algebra with Exercises for Secondary Schools and Colleges. By George Egbert Fisher, M. A., Ph. D., and Isaac J. Schwatt, Ph. D., Assistant Professors of Mathematics in the University of Pennsylvania. Part I. 8vo. Cloth. Price, \$1.25. xiii + 683 pages. Published by the authors.

This work begins with the very elements of algebra, establishing by rigorous demonstrations, and making clear by numerous illustrations, the fundamental Laws and Theorems, through the Fundamental Operations, Fractions, Equations of one, two, etc., unknown

quantities, Evolution, Inequalities, Quadratic Equations, Proportion and Variation, Progressions, and ends with a discussion of the Binomial Theorem for Positive Integral Exponents. Some of the strong points in favor of this work are: The solutions of equation based upon equivalent equations and equivalent systems of equations; the discussion of general problems and the interpretation of positive, negative, zero, indeterminate, and infinite solutions of problems; the logical discussion of irrational numbers; and the full treatment of inequalities. An unusually large number of problems and exercises have been added, in order that the teacher from year to year, may have variety with different classes. The work is one of unusual merit and is worthy the patronage of teachers desiring to put a good book into the hands of their pupils. The print is large and clear, the printed page is not overcrowded, and the binding is good.

B. F. F.

Introduction to the Theory of Analytic Functions. By J. Harkness, M. A. (Cambridge), Professor of Mathematics, Bryn Mawr College, Pa., and F. Morley, Sc. D. (Cambridge), Professor of Mathematics, Haverford College, Pa. Large 8vo. Cloth. xv + 336 pages. Price, \$3.00. New York: The Macmillan Co.

This work, as its name indicates, is an introduction to the Theory of Functions. Until the translation of Durege's Elements of the Theory of Functions by Drs. Fisher and Schwatt, in 1896, there was no work in English giving a consecutive and elementary account of the fundamental concepts and processes employed in the Theory of Functions. The translation referred to above has been very helpful in aiding the student in making some headway in the larger works in English, viz., Forsyth's Treatise, and Harkness and Morley's Treatise. To still further aid in introducing the student to the advanced works, the work before us is intended. The work begins with a treatment of the Ordinal Number System. This discussion while very elementary, is of the highest importance, and might well be incorporated in some works on arithmetic, for it is true that few arithmetics at present bear evidence of the great progress and improvement made in mathematics. Chapter II treats of the Geometric Representation of Complex Number; Chapter III, of the Bilinear Transformation; Chapter IV, of Geometric Theory of the Logarithm and the Exponential; Chapter V, of the Bilinear Transformation of the Plane into Itself; Chapter VI, of Limits and Continuity; Chapter VII, of Rational Algebraic Functions; Chapter VIII, of Convergence of Infinite Series; Chapter IX, of Uniform Convergence of Real Series; Chapter X, of Power Series; Chapter XI, of Operations with Power Series; Chapter XII, of Continuation of Power Series; Chapter XIII, of Analytic Theory of the Exponential and Logarithm; Chapter XIV, of Singular Points of Analytic Functions; Chapter XV, of Weirstrass's Factor-Theorem; Chapter XVI, of Integration; Chapter XVII, of Laurant's Theorem and the θ -Functions; Chapter XVIII, of Functions Arising from a Network; Chapter XIX, of Elliptic Functions; Chapter XX, of Simple Algebraic Functions on Riemann Surfaces; Chapter XXI, of Algebraic Functions; Chapter XXII, of Cauchy's Theory and the Potential. The work forms an excellent introduction to the authors' Treatise.

B. F. F.

An Elementary Course in Analytical Geometry. By J. H. Tanner, Assistant Professor of Mathematics in Cornell University, and Joseph Allen, formerly Instructor in Mathematics in Cornell University, Tutor in the College of the City of New York. 8vo. Cloth. xx + 390 pages. Price, \$2.00. New York, Cincinnati, and Chicago: The American Book Co.

This is the first of the Cornell Mathematical Series. In addition to the usual discussion of the Conic Section, there is 22 pages devoted to the discussion of Higher Plane Curves; 50 pages to Solid Analytical Geometry, and an Appendix of 10 pages in which is a short historical account of the invention of Analytical Geometry, discussions of the limiting cases of series, and the demonstration of the proposition due to Hamilton, Quételet, and others. The work is interspersed with brief historical notes adding much interest to the study of the subject.

B. F. F.